BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL, PRINCIPAL BENCH NEW DELHI

OA No. 187/2023

Shailandra Kumar Yadav   Applicant

Versus

State of H.P.   Respondent

INDEX

Date : 05.07.2025
Place : Theog

Divisional Forest Officer
Theog Forest Division, Theog

Respondent

Through

Divyanshu Kumar Srivastava
48, Lawyers' Chamber, Supreme Court of India
Tilak Marg, New Delhi 110001

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Report in compliance to the order dated 22.04.2025 passed in above titled OA

Respectfully submitted –

1. That this Hon'ble Tribunal on 22-04-2025 passed the following order –

"**7.** *Taking into consideration of the above the State of Himachal Pradesh is hereby directed to provide:-*

    a)   *A suitable approach for utilizing the horse dung in a eco-friendly manner and with the time frame for implementation.*

    b)   *A comparative chart showing various methodologies for dung processing*

    c)   *The exact number of horses year-wise based on scientific carrying capacity methodology.*

    d)   *The exact number of tourists that the area can accommodate in a day based on the carrying capacity study.*

    8. The report by State of Himachal Pradesh be filed within four weeks.

    9. List on 14.07.2025"

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2. That an unconditional apology is tendered before the Hon'ble Tribunal for not submitting the desired report/suggestions within a

time as directed by the Hon'ble Tribunal in the order dated 22.04.2025.

3. That a meeting of the was held with officers of HP Pollution Control Board and the Department of Science, Technology and Environment & Climate Change for compliance on action required for disposal of horse-dung in an eco-friendly manner, comparison of methodologies for dung disposal and carrying capacity calculated for horses and tourists (**Annexure R I**).

4.

a) **Suitable approach for utilizing the horse dung in an eco-friendly manner and with the time frame for implementation**

Detailed plan for vermi-composting

1. **Total quantity of generation of horse dung**

The Forest Department assessed the quantity of horse dung accumulated form February 2024 to December 2025. The total number of horse trips plied in the Kufri-Mahasu trail was 2,63,489 and each horse plied thrice a day the amount of horse dung fallen in the trail was 440 Tons (determined by taking into account horse-dung 5 kg/horse/movement along the trail). Taking the account of trips, the horse-dung quantity fallen in the forest was estimated in the range of 400-500 Ton per year.

2. **Collection point**

Initially the horse-dung is being collected manually and heaped at isolated and accessible road-side. After 7-10 day the heaped horse-dung is being sent for processing being done in two-stages –

i. **Manuring** is done in the first stage, in which the fresh horse-dung is being collected manually and carried by vehicles to three pits for drying and decomposition, which

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takes 1.5 – 2 months. The heaped fresh horse-dung along the road-side is being transported 'and collected in the first pit sized 5 x 5 x 2 m. Partially dried material is being shifted in the second pit (3 x 3 x 2 m) and thereafter 15 – 20 days, the partially dried horse-dung is again being shifted in the third pit (3 x 3 x 2 m).

ii. **Vermi-composting** is being done in the second stage. Partially dried and decomposed horse-dung manure is being transported to the Forest Nursery connected by metalled road located at 20 km from the manuring site. In this nursery there are 13 cemented vermi-composting pits and size of each pit is 3 x 3 x 1 m. Each pit can process 50 quintals of dung.

3. **Feasibility of horse-dung transportation to pits where composting is being done**

All the fresh horse dung is collected and heaped manually on the road-side. The fresh horse-dung is carried using carrier-vehicle to the manuring site, which is about 2 km in isolated forest. After partial drying and decomposition of the horse-dung, the manure is transported to the Nursery of Forest Department located downhill 20 km and accessible by the metalled road. During manuring and vermi-composting there is sufficient availability of labour as well as space for processing of the horse-dung.

4. **Manner of transportation**

Initially the horse-dung manually collected on the trail and heaped at isolated and accessible spot of road. Thereafter, horse-dung is loaded on the carrier-vehicle and carried to the manuring site located at about 2 km from loading point. The horse-dung is subjected to manuring for 1.5 – 2 months and after partial drying

and decomposition it is again shifted in carrier-vehicles to the Nursery of Forest Department located 20 km downhill from the manuring site.

5. **Transportation cost**

The total cost being incurred on the manual collection and transportation of horse-dung in manuring and vemi-composting is Rs. 79000, as given in the table below

S. No.	PARTICULARS	COST INCURRED (₹)
1.	Manual collection	54,000
2.	Transportation to manuring pits	18,000
	Total	**72,000**
3.	Transportation to vermicomposting pits	7,000
	Grand Total	**79,000**

6. **Availability of land for composting of pits**

The treatment of horse-dung is being done two stages.

In the **first stage**, manuring is done for 1.5 − 2 months in an isolated area of forest which is located 2 km from the initial collection point of horse-dung. For manuring three pits have been dug. The dimension one pit is 5 x 5 x 2 m and the other two pits are 3 x 3 x 2 m.

In the **second stage** the horse-dung manure is subjected to the vermi-composting in the nursery of the Forest Department located 20 km from the manuring point. There are cemented and roofed 13 vermi-compost pits and each pit is of the size 3 x 3 x 1 m.

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7. **Design of Manuring (Stage I) and Vermi-composting (Stage II) pits**

For the purpose of manuring there are three pits that are located in the isolated spot in the forest. The pit-size of 5 x 5 x 2 m can accommodate upto 30 – 40 tons of horse-dung. Other two pits of size 3 x 3 x 2 m can accommodate the horse-dung upto 20 - 25 metric tons.

For vermi-composting there are thirteen pits constructed in the nursery of the Forest Department. Each pit is constructed of the bricks masonry and a roof provided by the CGI sheet. The size of each vermi-composting pit is 3 x 3 x 1 m, that can accommodate 5 tons of horse-dung.

8. **Time taken for manuring and vermi-composting**

In the **first stage** the manuring of horse-dung involves drying and partial degradation of horse-dung. Three pits dug out in the isolated space in the forest nearby Kufri. This process takes about 1.5 – 2 months.

In the **second stage**, after horse-dung manure is transported by carrier-vehicles to the nursery of the Forest Department. The manure is subjected to vermi-composting that takes about 2.5 – 3 months.

9. **Extent and number of composting pits required considering the horse dung generated per day**

The Forest Department had assessed the quantity of horse dung accumulated over a period of one year to be 400 – 500 tons.

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S. No.	PARTICULARS	REMARKS
1.	No. Of months	12
2.	No. of lots for manuring	6-8
3.	Time taken for manuring each lot	1.5-2 months
4.	Collection of horse dung during the year	400-500 tons
5.	Stage – I manuring capacity per lot	60-80 tons
6.	Material required for manuring annually	360-640 tons
7.	Surplus horse-dung	Nil

	PIT I	PIT II	PIT III	TOTAL
SIZE (M)	5 X 5 X 2	3 X 3 X 2	3 X 3 X 2	
CAPACITY AVAILABLE FOR MANURING IN STAGE I (TONS)	30 – 40	15 – 20	15 – 20	60 – 80 TONS

In the first stage horse-dung is kept in pits for a period of 1.5-2 months and then in stage II it is transported to the nursery of the Forest Department for vermi-composting thereby making space for the second month's supply of horse-dung. During the period of

manuring there is decrease up to 30% in weight and volume of horse-dung due to drying and partial decomposition.

Thereafter, horse-dung manure is transported to the nursery of Forest Department for vermi-composting. There are already 13 permanent pits constructed for vermi-composting. Each pit of size 3 x 3 x 1 m can accommodate 5 tons of animal matter and in one lot it can process 65 metric tons of animal matter within 2.5-3 months.

10. **Number of days taken for manuring and vermi-composting**

In the first stage, manuring takes 30 – 45 days. Thereafter, horse-dung manure transported to the nursery of Forest Department downhill 20 km.

In the second stage, vermi-composting of horse-dung manure is done which takes about 2–3 months to complete and thereafter the vermi-compost is mixed with soil and filled in the seedling bags.

11. **Manner of disposal of vermi-compost and entities who will be using/buying this vermi-compost**

Each pit in the nursery would process 200 quintals (20 tons) of horse-dung manure in a year, as given in a following table:

S. No.	Months	Vermi-composting of horse-dung manure (Qtl)
1.	Jan – Apr	50
2.	May – Jun	50
3.	Jul – Sep	50
4.	Oct – Dec	50
		200

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It was observed that there is upto 30% loss in weight and volume during manuring of fresh horse-dung. It is estimated that there will be availability of 350 tons of horse-dung manure during the year and single nursery of Forest Department will not be able to process it. Therefore, other nurseries of the Forest Department will also be engaged for the vermi-composting of horse-dung manure during the year, as given in the table below:

S. No.	Name of the forest nursery	Name of Forest Division	No. of vermi-compost pits	Requirement of horse-dung for vermicompost (tons)	Availability of horse-dung	Shortfall
1.	Sainj	Theog	13	260	220	40
2.	Nahol	Theog	2	40	30	10
3.	Dhanain	Shimla	3	60	50	10
4.	Thachi	Shimla	3	60	50	10
			21	420	350	70

The shortfall of horse-dung manure as exhibited in the above table would be compensated by using and mixing of cow-dung manure for vermi-composting.

12. **Requirement of entities with regard to the use of vermi-compost**

Initially four nurseries of the Forest Department have been identified to consume the vermi-compost generated by using horse-dung manure. The vermi-compost will be used in the mixture of

seedling bags. The detail given in the above Table shows that the vermi-compost would be used by seedlings growing in the nursery and would not be available for sale to general public.

b) **A comparative chart showing various methodologies for dung processing**

Drying Unit for briquetting (capacity 20 tons per day)

S. No.	INPUT/PARTICULARS	COST
1.	Machine installation	70,00,000
2.	Misc. Fixed Assets (Plant and machinery erection; power and electrical fixtures; Fuel; Furniture fixtures; computer with accessories and tools, · etc.) @10% of the cost of machine installation	7,00,000
	Total	77,00,000
	Recurring Cost/month	
3.	Power consumption per month (@32 unit/hour; each unit costing ₹6.25/unit; working 8 hours per day)	48,000
4.	Wood consumption per month (@2 quintals/hour; ₹1130/quintal; 8 hours/day)	5,42,400
5.	Manpower wages per month	
	Plant operator (6) @₹452/day	81,360
	Mechanic/Electrician (2) @₹452/day	27,120
	Supervisor @₹452/day	13,560
	Security Guards (2) @₹437/day	26,220
	Skilled labourers (2) @₹415/day	24,900
	Unskilled labourers (4) @₹400/day	48,000
6.	Transportation cost per month (vehicles loading and transportation of dung	18,000

	from collection site to drying unit)	
7.	Total recurring Cost	8,29,560
	Cost per kg	**Approx. ₹42**

Horse-dung processing involving Manuring (Stage I) and Vermi-composting (Stage II)

	Stage I (Manuring)	
1.	Expenditure for digging three number manuring pits One 5 x 5 x 2 m; and two 3 x 3 x 2 m (including drainage and roofing)	1,10,000
	Recurring cost/Month	
2.	Manual collection of horse-dung	54,000
3.	Transportation of horse-dung to the manuring pits	18,000
	Total cost	**72,000**
	Stage II (Vermi-composting)	
4.	Transportation and unloading of manured horse-dung at the Forest Nursery (per trip)	7,000
	Total Cost	**7,000**
	Recurring cost of Stage I + Stage II	**79,000**
	Cost per kg	**Approx. ₹16**

The unconditional apology is tendered before the Hon'ble Tribunal that the cost for construction of the dryer-plant was inadvertently reported to be ₹70 crores, which in fact was ₹0.70 crores (Rupees 70 Lacs). It is therefore prayed before the Hon'ble Tribunal that kindly the revision for establishment of cost of the dryer-plant may be taken on record for reasonable comparison between different methodologies. After comparing two methodologies, it is evident that the first option of briquetting of dried horse-dung using the dryer-plant is both cost and

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labour-intensive as compared to the second option in which the horse-dung is processed using manuring and vermi-composting techniques. Per kg cost in case of dryer-plant has been worked out to be ₹42 per kg which is much higher as compared to the vermi-composting technique of processing the horse-dung that comes to approximately ₹16 per kg. There will be increase in the carbon-footprint in case of briquetting of horse-dung and moreover the calorific value of horse-dung briquettes is much lesser as compared to briquettes made out of other substitutes (**Annexure R I**)

c)   **The exact number of horses year-wise based on scientific carrying capacity methodology**

It is submitted before the Hon'ble Tribunal that in order to determine the exact number of horses based on carrying capacity that will move on the Kufri-Mahasu Horse Trail, various factors were taken into consideration. The objective of horse movement is tourism. Therefore, the following factors will govern movement of horses carrying tourists on the horse-trail, detailed below –

   i.)   Effective area of the horse-trail (square meter)

   ii.) Area used by one horse (per square meter)

   iii.) Rotation factor (total time available to horses for movement on the horse-trail)

   iv.) Cloudy/over-cast/rainy/snowy days

   v.)   Slope of the horse-trail

   vi.) Ease of access to the horse-trail

   vii.) Management capacity of the Forest Department to control the movement of horses

   viii.) Cleaning of Horse-dung

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One of the important factors was skipped inadvertently i.e. horse-dung in the report submitted before the Hon'ble Tribunal in this case listed for hearing on 22.04.2025, therefore it has now been included as one of the determinants to refine the carrying capacity of horses. The man-power required to control the tourist movement as well as clearing of the annual generation of horse-dung was taken into account. Effective Carrying Capacity was the final outcome for determining the exact number of horses that move on horse-trail per day and during the whole year. Therefore, the 293 number of horses per day based on the Effective Carrying Capacity of Cifuents' formula, are recommended for movement horses (**Annexure R I**).

d) **The exact number of tourists that the area can accommodate in a day based on the carrying capacity study**

It is submitted before the Hon'ble Tribunal that in order to determine the exact number of tourists that the area can accommodate in day at Mahasu Peak is based on carrying capacity taking account various factors. All tourists visit Kufri with an objective to come to Mahasu-Peak, highest point in the area. Tourist come to Mahasu Peak by accessing two routes. First route is the horse-trail and the other route link road connecting the National Highway No. NH-05. Therefore, the following factors govern the number of tourists that can be accommodated in the area, detailed below –

    i.) Effective area (Square meter)

    ii.) Area used by one tourist (per square meter)

    iii.) Rotation factor (ratio of total time available for tourist activities to the normal time spent by each tourist)

    iv.) Cloudy/overcast/Rainy/Snowy days

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v.) Slope of the area

vi.) Ease of access to the area

vii.) Area for free movement

viii.) Sanitation and Cleanliness

The sanitation and cleanliness have been included to refine the carrying capacity of the area that will accommodate tourists in the Park. Taking into account all factors mentioned above, Effective Carrying Capacity of the Park per day would be 2232 number of tourists recommended per day in the area for tourism related activities (**Annexure R I**).

That in view of the above, it is submitted that the present report may kindly be taken on record.

Manish Rampal
Divisional Forest Officer
Theog Forest Division, Theog

Through

Divyanshu Kumar Srivastava
48, Lawyers' Chamber, Supreme Court of India
Tilak Marg, New Delhi 110001

Date: 05.07.2025
Place: Theog

BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL, PRINCIPAL BENCH NEW DELHI

OA No. 187/2023

Shailandra Kumar Yadav   Applicant

Versus

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AFFIDAVIT IN SUPPORT OF CLAIM REPORT

I, Manish Rampal, HPFS s/o Sh. BK Rampal, aged, 54 years presently posted as Divisional Forest Officer, Theog Forest Division, Theog do hereby solemnly affirm and declare on oath as under.

1. That the accompanying report in compliance to the order dated 22.04.2025 passed in above titled OA has been drafted and prepared at my instance and under instruction.

2. That the contents of para 1 to 7 are true and correct to the best of my knowledge and belief and as per the information derived from the official record and correct to the best of my knowledge.

3. I further state that nothing material has been concealed.

Divisional Forest Officer
DEPONENT
Theog Forest Division, Theog

VERIFICATION

I, the above named deponent further verify that the contents of my above report are true and correct to my knowledge. No part of it is false and nothing material has been concealed therefrom.

Verified at Theog on this 5th day of July 2025.

DEPONENT

Divisional Forest Officer
Theog Forest Division, Theog

ATTESTED

Oath Commissioner
Vikram Verma

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Certified that the above/overleaf named who
declared before me on solemn affirmation on
this 11 day of 7 2023 at
................in the District Shimla H P
by Sh Deeping
who was identified by Sh Daulat Ram, Clerk
who is personally known to me The contents of
the affidavit are duly read over and expl at DFo office
the deponent in vernacular who admitted the Talag
contents thereof to be true and correct.

Oath Commissioner
Vikram Verma

IDENTIFIED BY

ANNEXURE R I

Proceedings of the meeting held in case of OA No. 187/2023 "Shailendra Kumar Yadav vs State of H.P. & Ors." for compliance on action required for the order dated 22.04.2025 in the Regional Office of HP Pollution Control Board, Him Parivesh, Phase III, New Shimla on 26.06.2025 at 11 am.

The following Officers were present during the meeting –

i.   Sh. Anil Joshi, IFS, Member-Secretary, HP Pollution Control Board

ii.   Sh. K. Thirumal, IFS, Chief Conservator of Forests, Shimla Circle

iii.   Dr. S.C. Attri, Chief Scientist, Jt. Secretary, Deptt. Environment, Science and Technology & Climate Change, Govt. of H.P.

iv.   Sh. Manish Rampal, HPFS, DFO Theog

v.   Er. Lalit Thakur, Environmental Engineer, HP Pollution Control Board, Shimla

At the outset, Member-Secretary (HPPCB) extended welcome to all the members in the meeting.

The meeting was called for discussion on the actions to be taken on the orders of Hon'ble National Green Tribunal regarding

a) A suitable approach for utilizing the horse dung in an eco-friendly manner and with the time-frame for implementation

b) A comparative chart showing various methodologies for dung processing

c) The exact number of horses year-wise based on scientific carrying capacity methodology

d) The exact number of tourists that the area can accommodate in a day based on the carrying capacity study

a) **A suitable approach for utilizing the horse-dung in an eco-friendly manner and with the time-frame for implementation**

It was informed by the DFO Theog that during the whole year horse-dung generated over the trail by horse was estimated to be 400-500 Tons. It was apprised that the horse-dung was treated in a two-stage process. In the first stage the horse-dung was collected by the labour. After every 7-10 days the horse-dung was carried in vehicle to be deposited in the pits. These pits were were dug-out for the manuring collected horse-dung. The Environmental Engineer suggested to improvise the pits dug in the soil to be cemented to prevent the leachates from going into the soil. The Member-Secretary also assured to sponsor the development of "manuring pits" that will confirm to the standard design to prevent any pollutant moving around or down into the ground-level. It was also suggested to cover the pits by the roof and providing the side drain for preventing the water from entering into the manuring-pit. The Chief Scientist with the Deptt. of Environment. Science and Technology & Climate Change suggested that the Kufri being located on high altitude would slow down the manuring process. The Hon'ble member was informed that the manuring was the first stage in order to decrease the weight as well as volume of horse-dung over a period of 1.5 -2 months due to natural degradation of the horse-dung. The second stage was the vermi-composting of the horse-dung manure, in which it was carried to the low-lying nursery of Forest Department. In that nursery the manure is being subjected to the treatment by earthworms in the cemented vermi-

compost pits, that took 3 months for production of the vermi-compost. It was suggested and agreed by other members that normal earthworms need to be replaced by red-wigglers for better results. DFO Theog apprised the members, that there were 13 number of vermi-compost pits available in the Forest Nursery at Sainj and each pit was designed to handle 50 quintals of animal matter to produce vermicompost. These vermi-compost pits were made as per standard design of the size 3 x 3 x 1 m. The Chief Scientist recommended that the production of vermi-compost takes nearly 2-3 months and in a year each pit could process 20 tons of horse dung during the year and for this reason the Forest Department would at least require 25 pits to process the available horse-dung. The worthy member was apprised that due to this reason the whole process was divided into two stages i.e. Stage I (Manuring) and Stage II (vermi-composting). The annually available 500 tons of horse-dung was initially subjected to Stage (Manuring) in which its weight and volume reduced by 30% and therefore 350 tons of horse-dung was available for Stage II of vermi-composting. Therefore, instead of 25 pits the Forest Department would only require 18 pits to which every member agreed.

The Member-Secretary desired to know the time-frame according to which the annually available horse-dung would be utilized. The Chief Conservator of Forests provided with following plan of vermi-composting of horse-dung manure in each pit

S. No.	Months	Vermi-composting of horse-dung manure (Qtl)
1.	Jan – Apr	50
2.	May – Jun	50
3.	Jul – Sep	50
4.	Oct – Dec	50
		200

Keeping in view this information, Chief Conservator of Forests further apprised all members that each pit in the nursery would process 200 quintal (20 tons) of horse-dung in a year. Keeping this in view five nurseries in the Shimla Forest Circle had been selected to take up vermi-composting of horse-dung manure.

The DFO Theog apprised all members with following table the availability of horse-dung to different nurseries of the Forest Department

S. No.	Name of the forest nursery	Name of Forest Division	No. of vermi-compost pits	Requirement of horse-dung for vermicompost (tons)	Availability of horse-dung	Shortfall
1.	Sainj	Theog	13	260	220	40
2.	Nahol	Theog	2	40	30	10
3.	Dhanain	Shimla	3	60	50	10
4.	Thachi	Shimla	3	60	50	10
			21	420	350	70

Worthy Chief Scientist desired to know how the shortfall for vermi-composting was going to be met with, it was suggested by the Chief Conservator of Forests that it would be compensated by the mixing of cow-dung in the vermi-compost mixture, to which all members agreed.

b) **A comparative chart showing various methodologies for dung processing**

Before all members it was presented by the DFO Theog that two methodologies have been worked out for dung disposal. The first option involved briquetting of horse-dung after drying and then using the briquettes for the purpose of energy generation. The second option involved processing of horse-dung by manuring and vermi-composting. The comparison of both methods was exhibited and presented before members for discussion.

First option: Drying Unit for briquetting (capacity 20 tons per day)

S. No.	INPUT/PARTICULARS	COST
1.	Machine installation	70,00,000
2.	Misc. Fixed Assets (Plant and machinery erection; power and electrical fixtures; Fuel; Furniture fixtures; computer with accessories and tools, etc.) @10% of the cost of machine installation	7,00,000
	Total	77,00,000
	Recurring Cost/month	
3.	Power consumption per month (@32 unit/hour; each unit costing ₹6.25/unit; working 8 hours per day)	48,000
4.	Wood consumption per month (@2 quintals/hour; ₹1130/quintal; 8 hours/day)	5,42,400
5.	Manpower wages per month	
	Plant operator (6) @₹452/day	81,360
	Mechanic/Electrician (2) @₹452/day	27,120
	Supervisor @₹452/day	13,560
	Security Guards (2) @₹437/day	26,220
	Skilled labourers (2) @₹415/day	24,900
	Unskilled labourers (4) @₹400/day	48,000
6.	Transportation cost per month (vehicles loading and transportation of dung from collection site to drying unit)	18,000
7.	Total recurring Cost	8,29,560
	Cost per kg	**Approx. ₹42**

Second option: Horse-dung processing by using Manuring (Stage I) and Vermi-composting (Stage II)

	Stage I (Manuring)	
1.	Expenditure for digging three number manuring pits One pit 5 x 5 x 2 m; and two pits 3 x 3 x 2 m (including drainage and roofing)	5,00,000
	Recurring cost/Month	
2.	Manual collection of horse-dung	54,000
3.	Transportation of horse-dung to the manuring pits	18,000
	Total cost	72,000
	Stage II (Vermi-composting)	
4.	Transportation and unloading of manured horse-dung at the Forest Nursery (per trip)	7,000
	Total Cost	7,000
	Recurring cost of Stage I + Stage II	79,000
	Cost per kg	Approx. ₹16

The members agreed that the second option was economical and better eco-friendly as compared to the first option. The Chief Scientist opined that the first option will increase the carbon-footprint as compared to the second option. The DFO Theog added that though the calorific value of the horse-dung was 2900 kcal/kg but it was low enough than the briquettes of chil-pine needles with calorific value upto 3000-3500 kcal/kg according to the Nalagarh-based briquette manufacturing unit, which was earlier suggested by the Environment Engineer. Moreover, the ash content in the horse-

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dung briquettes was found to be mɋre as compared to Chil pine needles.

c) **The exact number of horses year-wise based on scientific carrying capacity methodology**

DFO Theog presented for discussion before members following factors governing the carrying capacity of horses –

i.) Effective area of horse-trail (sqm)

ii.) Area used by one horse (per sqm)

iii.) Rotation factor (total time available to horses for movement on the horse-trail)

iv.) Cloudy/over-cast/rainy/snowy days

v.) Slope of the horse-trail

vi.) Ease of access to the horse-trail

vii.) Management capacity of the Forest Department to control the movement of horses

viii.) Management of Horse-dung

All the member were apprised that the application of Cifuentes' formula was used to determine the exact number of horses per day and assessed year-wise based number. In the deliberations, members agreed that Management Capacity required to include the number of man-power required to control the tourist movement as well as clearing the annual generation of horse-dung. The Chief-Scientist suggested that keeping in view the length of horse-trail, horse movement should be allowed within the range of 300-350. The exact number of horses per day based on the scientific carrying capacity methodology worked out

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calculating the Effective Carrying Capacity using the formula:

ECC = RCC x Mc

Where, ECC – Effective Carrying Capacity

RCC – Real Carrying Capacity

Mc – Management Capacity (**Annexure I**),

RCC (Real Carrying Capacity) was derived from Physical Carrying Capacity (**Annexure I**)

RCC = 1757

Mc = 0.167

ECC = 1757 x 0.167

ECC = 293.42 or 293 horses/day

It was agreed by all members that number of horses moving over the trail of 1.082 km would be 293 horses per day. However, when calculated year-wise, the number of horses according the carrying capacity would be 1,06,945.

d) **The exact number of tourists that the area can accommodate in a day based on the carrying capacity**

DFO Theog informed the members that tourists visit the Mahasu Peak area by horse-trail as well as by another link road connecting the NH – 05. The following factors govern the number of tourists that can be accommodated in the area, detailed below –

i.) Effective area (sqm)

ii.) Area used by one tourist (per sqm)

iii.) Rotation factor (ratio of total time available for tourist activities to the normal time spent by each tourist)

iv.)   Cloudy/Overcast/Rainy/Snowy days

v.)   Slope of the area

vi.)   Ease of access to the area

vii.)   Area for free movement

viii.)   Sanitation and Cleanliness

      The Member-Secretary and the Chief-Scientist were of the view that the garbage generation was directly linked with the number of tourists coming to the Park. The Chief-Scientist suggested that the number of tourists to be allowed in the Park should range between 1500-2500 per day. In order to properly manage the area, garbage generation needed to be addressed. Therefore, sanitation and cleanliness were added as one of the key factors to refine the effective carrying capacity. The Cifuents' formula was used for determination of the carrying capacity of visitors at Mahasu Peak and

> The exact number of tourists per day in the park was based on the scientific carrying capacity methodology worked out calculating the Effective Carrying Capacity using the formula:

ECC = RCC x Mc

Where, ECC – Effective Carrying Capacity

       RCC – Real Carrying Capacity

       Mc – Management Capacity (**Annexure II**),

RCC (Real Carrying Capacity) was derived from Physical Carrying Capacity (**Annexure II**)

RCC = 42754

Mc = 0.0522

ECC = 42754 x 0.0522

ECC = 2231.76 or 2232 tourists/day

The exact number of visitors paying visit to the Park was worked out to be 2232 per day, to which all member agreed.

The meeting ended with the vote of thanks to the chair.

Divisional Forest Officer
Theog Forest Division

Endst. No. _1541 – 44_   Dated _05. 07. 2025_

1. Member-Secretary, HP Pollution Control Board, Him Parivesh, Phase III, New-Shimla

2. Chief Conservator of Forests, Shimla Circle, Shimla.

3. Chief-Scientist-cum-Joint Secretary, Deptt. of Environment, Science and Technology & Climate Change, Govt. of Himachal Pradesh, Shimla.

4. Environmental Engineer, HP Pollution Control Board, Him Parivesh, Phase III, New-Shimla

ANNEXURE I

ASSESSMENT OF CARRYING CAPACITY OF HORSES ON THE KUFRI – MAHASU TRAIL

(A)   Assessment of the **Physical Carrying Capacity (PCC)** of the horse-trail from Kufri to Mahasu using the Cifuentes formula

S. No.	PARTICULARS	DETAIL
1.	Effective area of horse trail from Kufri to Mahasu Peak	5419 m^2
2.	Area used by one horse per sq. m	$3 \times 3 = 9 \text{ m}^2$
3.	Rotation factor (RF)	8/1.5 hours

PCC = A x V/a x Rf

PCC = Physical Carrying Capacity (Maximum number of visits that can be carried out in one day)

Suitable tourism Area(A) =   Effective Area of the horse trail from Kufri to Mahasu = 5419 m^2

Visitor/Area (V/a) =   Area needed by the horse to travel conveniently = $1/9 \text{ m}^2$

Rf =   Rotation factor = 8/1.5 hours

$$PCC = \quad 5419 x \frac{1}{9} x \frac{8}{1.5}$$
PCC = 3211 horses

(B)   Assessment of **Real Carrying Capacity (RCC)** of the horse-trail from Kufri to Mahasu
RCC = PCC x CF_1% x CF_2% x CF_3%
RCC = Real Carrying Capacity (Maximum number of horses that can travel on the horse trail from Kufri to Mahasu Peak,

based on correction factors according to the local biophysical characteristics)

CF_1 (Correction Factor 1) = Cloudy/over-cast days correction factor

CF_2 (Correction Factor 2) = Slope correction factor

CF_3 (Correction Factor 3) = Accessibility correction factor

i.) CF_1 (Cloud overcast correction factor) = Data based on the average of **25 years** w.e.f 2000 to 2024 received from regional office of IMD at Shimla

Table 1: Number of rainy/overcast days for the past 25 years

S. No.	Month	Overcast days
1.	January	6.68
2.	February	7.08
3.	March	9.08
4.	April	8.0
5.	May	10.36
6.	June	14.76
7.	July	22.76
8.	August	23.04
9.	September	13.32
10.	October	3.36
11.	November	2.08
12.	December	3.24
	Average	**10.31**

$$CF_1\% = \frac{100 - CF_1}{100} = \frac{100 - 10.31}{100} = 0.8969$$

ii.)   **CF_2 (Slope level correction factor)**

Table 2: Slope level correction data

S. No.	Slopes	Category	Assessment criteria
1.	0 - 8%	Level	20
2.	8 - 15%	Sloping	40
3.	15 - 30%	Rather steep	60
4.	30 - 40%	Steep	80
5.	> 40%	Very steep	100

Altitude of Kufri = 2622m (above mean sea level)

Altitude of Mahasu Peak = 2729m (above mean sea level)

Gain in altitude = 2729 − 2622 = 107m

Length of the horse-trail = 1082m

Slope = $\frac{107}{1082}$ x 100 = 9.889 or 10%

Slope along the horse-trail from Kufri to Mahasu Peak = 10%

CF_2 = 40

$CF_2\% = \frac{100-CF_2}{100} = \frac{100-40}{100} = 0.60$

iii.)   **CF_3 (Accessibility correction factor)** 200 m is the threshold limit required for convenient movement

Table 4: Accessibility correction factor

S. No.	Accessibility	Distance (meters)	Accessibility correction factor
1.	Horse-trail from Kufri to Mahasu Peak	1082	8.82

$CF_3 = \frac{1082-200}{100} = \frac{882}{100} = 8.82$

$CF_3\% = \frac{100-CF_3}{100} = \frac{100-8.82}{100} = 0.9118$

Table 5: Determinants for calculation of Real Carrying Capacity (RCC)

S. No.	Particulars	Detail
1.	PCC	3211
2.	$CF_1\%$	0.8969
3.	$CF_2\%$	0.6000
4.	$CF_3\%$	0.9118

Real Carrying Capacity (RCC)

RCC = PCC x $CF_1\%$ x $CF_2\%$ x $CF_3\%$

$= 3211$ x 0.8969 x 0.6000 x 0.9118

$= 1756.67$ or say 1757 horses

(C) Assessment of the **Management Capacity (Mc)** of the horse trail from Kufri to Mahasu

MC (Management Capacity)

$$MC = \frac{R_{n1}}{R_{t1}} \, x \, \frac{R_{n2}}{R_{t2}}$$

R_{n1} = Number of existing Management Officers
R_{n1} = 5
R_{t1} = No. of Management Officers required
R_{t1} = 15

R_{n2} = Optimal horse-dung generation per year
R_{n2} = 250 tons/year
R_{t2} = Annual horse-dung generation
R_{t2} = 500 tons per year

$$MC = \frac{5}{15} \, x \, \frac{250}{500}$$

Mc = 0.167

ANNEXURE II

ASSESSMENT OF CARRYING CAPACITY OF VISITORS AT THE MAHASU PEAK

Assessment of the **Physical Carrying Capacity (PCC)** of the tourists at the Mahasu Peak using the Cifuentes formula

S. No.	PARTICULARS	DETAIL
1.	Effective area of Mahasu Peak	27900 m^2
2.	Area used by one tourist per sq. m	1.56 x x1.56 = 2.4436 m^2
3.	Rotation factor (RF)	8/1.5 hours

(A)   **Physical Carrying Capacity (PCC)**

PCC = A x V/a x Rf

PCC = Physical Carrying Capacity (Maximum number of visits that can be carried out in one day)

Suitable area (A) =Area available for tourist activities at Mahasu Peak

Visitor/Area (V/a) = Area needed by the tourists for tourist activities conveniently

Rf = Rotation factor

$$PCC = 27900x \frac{1}{2.4436} x \frac{8}{1.5}$$

PCC = 60894

(B)   **Real Carrying Capacity (RCC)**

RCC = PCC x CF_1% x CF_2% x CF_3% x CF_4%

RCC = Real Carrying Capacity (Maximum number of tourists that can be accommodated on Mahasu Peak, based on correction factors according to the local biophysical characteristics)

CF₁ (Correction Factor 1) = Cloudy over-cast correction factor

CF₂ (Correction Factor 2) = Slope correction factor

CF₃ (Correction Factor 3) = Accessibility correction factor

CF₄ (Correction Factor 4) = Activity correction factor

i.) **CF₁ (Cloud overcast Correction factor)** = Data based on the average of 25 years w.e.f 2000 to 2024 received from regional office of IMD at Shimla

Table 2: Number of rainy/overcast days for the past 25 years

S. No.	Month	Overcast days
i.)	January	6.68
ii.)	February	7.08
iii.)	March	9.08
iv.)	April	8.0
v.)	May	10.36
vi.)	June	14.76
vii.)	July	22.76
viii.)	August	23.04
ix.)	September	13.32
x.)	October	3.36
xi.)	November	2.08
xii.)	December	3.24
	Average	**10.31**

$$CF_1\% = \frac{100-CF_1}{100} = \frac{100-10.31}{100} = 0.8969$$

ii.) **CF₂ (Slope level correction factor)**

Table 3: Slope factor correction data

S. No.	Slopes	Category	Assessment criteria
6.	0 - 8%	Level	20

31

7.	8 - 15%	Sloping	40
8.	15 - 30%	Rather steep	60
9.	> 40%	Very steep	100

Altitude of Mahasu Peak 1 = 2729 m (above mean sea level)

Altitude of Mahasu Peak 2 = 2714 m (above mean sea level)

Gain in altitude = 2729 − 2714 = 15 m

Length of the horse-trail = 402 m

$Slope = \frac{15}{402} \times 100 = 3.73\%$

Slope at Mahasu Peak = 3.73%

CF_2 as per Table 3 = 20

$CF_2\% = \frac{100 - CF_2}{100} = 0.80$

iv.) **CF_3 (Accessibility correction factor)** 200 m is the threshold limit required for convenient movement

Table 4: Accessibility correction factor

S. No.	Accessibility	Distance (meters)	Accessibility correction factor
1.	Activity area of Mahasu Peak for visiting tourists	402	2.02

$CF_3 = \frac{402 - 200}{100} = \frac{202}{100} = 2.02$

$CF_3\% = \frac{100 - CF_3}{100} = \frac{100 - 2.02}{100} = 0.9798$

v.) **CF_4 (Activity correction factor)**

Total available area at Mahasu Peak = 27900 m^2

Area occupied by different activities at Mahasu Peak hindering the free movement = 3609 m^2

Proportion area occupied by different activities $= \frac{3609}{27900} = 0.1294$

Correction Factor $CF_4\% = \frac{100-0.1294}{100} = 0.9987$

Table 5: Determinants for calculation of Real Carrying Capacity (RCC)

S. No.	Particulars	Detail
1.	PCC	60894
2.	$CF_1\%$	0.8969
3.	$CF_2\%$	0.8000
4.	$CF_3\%$	0.9798
5.	$CF_4\%$	0.9987

Real Carrying Capacity (RCC)

RCC = PCC x $CF_1\%$ x $CF_2\%$ x $CF_3\%$ x $CF_4\%$

RCC = 60894 x 0.8969 x 0.8000 x 0.9798 x 0.9987

RCC = 42754.42 or say **42754 tourists**

(C) Assessment of Management Capacity (Mc)

MC (Management Capacity)

$$MC = \frac{R_{n1}}{R_{t1}} \; x \; \frac{R_{n2}}{R_{t2}}$$

R_{n1} = Number of existing Officers
R_{n1} = 2
R_{t1} = No. of Officers required
R_{t1} = 15

R_{n2} = Optimal garbage generation per year

33

R_{n2} = 3000 kg/year

R_{t2} = Annual garbage generation

R_{t2} = 7665 kg per year

$$MC = \frac{2}{15} \ x \ \frac{3000}{7665}$$

$$MC = 0.052$$